

- c. When Gutzon Borglum designed the reliefs he carved into Mount Rushmore in South Dakota, he started with models $\frac{1}{12}$ the lengths of the actual reliefs. How does the area of each model compare to the area of each of the final reliefs? Explain why a relatively small decrease in the linear dimension results in a relatively large decrease in the surface area to be carved.



- d. Gulliver traveled to Brobdingnag, where people were 10 times as tall as normal people. If Gulliver had 2 m^2 of skin, how much skin surface would you expect a Brobdingnagian to have?
27. *Airplane Weight and Area Problem:* In 1896, Samuel Langley successfully flew a model of an airplane he was designing. In 1903, he tried unsuccessfully to fly the full-size airplane. Assume that the full-size plane was 4 times the length of the model (Figure 2-3h).

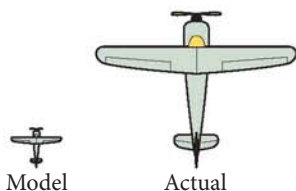


Figure 2-3h

- a. The wing area, and thus the lift, of similarly shaped airplanes is directly proportional to the square of the length of each plane. How many times more wing area did the full-size plane have than the model?
- b. The volume, and thus the weight, of similarly shaped airplanes is directly proportional to the cube of the length. How many times heavier was the full-size plane than the model?

- c. Why do you think the model was able to fly but the full-size plane was not?

28. *Compound Interest Problem:* Money left in a savings account grows exponentially with time. Suppose that you invest \$1000 and find that a year later you have \$1100 in your account.
- a. How much will you have after 2 yr? 3 yr? 4 yr?
- b. In how many years will your investment double?
29. *Archery Problem:* Ann Archer shoots an arrow into the air. The table lists its height at various times after she shoots it.

Time (s)	Height (ft)
1	79
2	121
3	131
4	109
5	55

- a. Show that the second differences between consecutive height values in the table are constant.
- b. Use the first three ordered pairs to find the particular equation of the quadratic function that fits these points. Show that the function contains all of the points.
- c. Based on the graph you fit to the points, how high was the arrow at 2.3 s? Was it going up or going down? How do you tell?
- d. At what two times was the arrow 100 ft high? How do you explain the fact that there were two times?
- e. When was the arrow at its highest? How high was that?
- f. At what time did the arrow hit the ground?
30. *The Other Function Fit Problem:* It is possible for different functions to fit the same set of discrete data points. Suppose that the data in the table have been given.